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III. Solution by H. C. WILKES, Skull Run, West Virginia; and A. H. BELL, Hillsborough, Illinois.

Factoring, etc.,  $(x^2 + 2m)(x^2 + 3m) = m^2 - \frac{n}{x}$ . Let  $x = n$ ; then  $x = n$ ,

$\pm\sqrt{-m-1}$ ,  $\pm\sqrt{1-2m}$ , which will be the five roots.

Or  $(x^2 + 3m)(x^2 + 2m) = (m + \sqrt{\frac{n}{x}})(m - \sqrt{\frac{n}{x}})$ . Assuming  $x^3 + 3m = \sqrt{\frac{n}{x}}$ ,

$x^3 + 2m = m - \sqrt{\frac{n}{x}}$ .  $x = \sqrt{-\frac{3m}{2}}$ ,  $m = 2\sqrt{\frac{n}{x}}$ ; hence  $x = \frac{4n}{m^2}$ . Substituting  $m =$

$2\sqrt{\frac{n}{x}}$  for  $m$  in eq. 1,  $x^5 + 10x^3\sqrt{\frac{n}{x}} + 21n = 0$ . This can be developed,  $x^{10} -$

$58nx^5 + 441 = 0$ .  $\therefore x = \sqrt[5]{49n}$  or  $\sqrt[5]{9n}$ .

[The above is not strictly a solution, but affords a method of discovering integer roots, if any. The solution of Professor Zerr is especially full and neat. EDITOR.]

Also solved by F. P. MATZ.

52. Proposed by F. P. MATZ, D. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pennsylvania.

In how many ways can we arrange 12 friends of the MONTHLY, around a table, so that; (1) the editors may never be together, (2) Matz and Halsted may never be apart, and (2) Zerr and Ellwood may always have Gruber betwixt them?

Solution by O. W. ANTHONY, M. Sc., Professor of Mathematics in New Windsor College, New Windsor, Maryland.

I. Considering one editor in position the other may occupy 9 places; but the first editor may take 12 places, and therefore the two take 108 positions. For each of these places the remaining nine mathematicians may be seated in 9 ways, making 1089 ways altogether.

II. If Matz and Halsted are never apart we may consider them as an element to be arranged as *each* of the other individuals. We then have 11 ways of arranging them without regarding the *internal* arrangement of the group; this may be arranged in two ways. We, therefore, have 211 as the number of arrangements.

III. By the same reasoning as in the last case we have the number of arrangements = 210.

NOTE.—No solution of problem 53 has as yet been received. The published solution of problem 49, in last issue, should have been credited to Prof. J. H. Grove, Howard Payne College, Brownwood, Texas.

## PROBLEMS.

59. Proposed by COOPER D. SCHMITT, M. A., Professor of Mathematics, University of Tennessee, Knoxville, Tennessee.

Demonstrate the identity  $2^{2n+1} \frac{d^n}{dx^n} \left( x^{n+\frac{1}{2}} \frac{d^{n+1}}{dx^{n+1}} e^{\sqrt{x}} \right) = e^{\sqrt{x}}$ .